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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/071,798	02/06/2002	Hugh Craig Hiner	RR-1749	2863

24501 7590 07/11/2003

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EXAMINER

TRAN, MAI HUONG C

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 07/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/071,798

Applicant(s)

HINER ET AL.

Examiner

Mai-Huong Tran

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-- Th MAILING DATE of this communication appears on the cover sheet with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10 and 12-13 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,515,895 to Naji in view of Saito et al. and further in view of the remark.

Regarding to claim 1, Naji discloses a device comprising a first electrode 11 having a magnetic moment with a direction that is substantially fixed in response to an applied magnetic field; a second electrode 12 having a magnetic moment with a direction that is variable in response to the applied magnetic field; and a tunnel barrier layer 14 separating the first and second electrodes. Naji does not disclose the tunnel barrier layer including a substantially homogenous, primarily dielectric material including a ferromagnetic element in an atomic concentration of less than five percent.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the tunnel barrier layer including a substantially homogenous, primarily dielectric material including a ferromagnetic element in an atomic concentration of less than five percent, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Claim 2 is rejected under the same rationale set forth above to claim 1.

Regarding to claim 3, the device is a part of a solid-state memory (Saito: col. 2, line 54).

Regarding to claim 4, the device wherein the tunnel barrier layer includes atoms of aluminum, cobalt and silicon (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Regarding to claim 5, the device wherein the tunnel barrier layer includes atoms of aluminum and iron (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Regarding to claim 6, the device wherein the tunnel barrier layer includes atoms of aluminum, iron and silicon (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Regarding to claim 7, the device wherein the tunnel barrier layer includes an oxidized alloy of aluminum (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Regarding to claim 8, the device wherein the tunnel barrier layer includes a nitridized alloy of aluminum (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Regarding to claim 9, the device wherein the tunnel barrier layer includes a nitridized alloy of aluminum, and the alloy is a single phase solid at 600°C (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Regarding to claim 10, the device wherein the second electrode has an easy axis of magnetization that is substantially parallel to the magnetic moment direction of the first electrode (Naji: Fig. 1).

Regarding to claim 12, the device wherein at least one of the first and second electrodes includes a half-metallic magnet (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Regarding to claim 13, the device wherein the tunnel barrier layer includes a half-metallic magnet (Naji: col. 2, lines 26-28, Saito: col. 11, lines 50-55).

Claim 11 is rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,515,895 to Naji in view of Saito et al. (6,522,573) and further in view of Gill (6,473,275).

Regarding to claim 11, Naji in view of Saito discloses the claimed invention except for the device wherein the second electrode has an easy axis of magnetization that is substantially perpendicular to the magnetic moment direction of the first electrode.

Gill discloses the device wherein the second electrode has an easy axis of magnetization that is substantially perpendicular to the magnetic moment direction of the first electrode as set forth in col. 3, lines 12-20 and fig. 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the device wherein the second electrode has an easy axis of magnetization that is substantially perpendicular to the magnetic moment direction of the first electrode, as taught by Gill in order to improve magnetoresistive coefficient without the problems associated with ferromagnetic coupling between the free layer and the pinned layers (col. 3, lines 32-35).

Claims 14-25 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,515,895 to Naji in view of Saito et al.

Regarding to claim 14, Naji discloses a device comprising a first ferromagnetic layer 11 having a magnetic moment with a direction that is substantially fixed in response

to an applied magnetic field; a second ferromagnetic layer 12 having a magnetic moment with a direction that is variable in response to the applied magnetic field; and a dielectric layer 14 separating the first and second ferromagnetic layers. Naji does not disclose the dielectric layer having a thickness of less than three nanometers, the dielectric layer including a ferromagnetic element substantially uniformly dispersed in the dielectric layer at an atomic concentration of less than about five percent. Saito teaches the dielectric layer having a thickness of less than three nanometers as set forth in col. 11, lines 1-4.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric layer having a thickness of less than three nanometers, the dielectric layer including a ferromagnetic element substantially uniformly dispersed in the dielectric layer at an atomic concentration of less than about five percent, as taught by Saito et al. in order to enable a higher capacity, to assure a high reliability, and to have a high yield (col. 2, lines 54-56).

Claim 15 is rejected under the same rationale set forth above to claims 1 and 14.

Claim 16 is rejected under the same rationale set forth above to claims 3 and 14.

Claim 17 is rejected under the same rationale set forth above to claims 10 and 14.

Claim 18 is rejected under the same rationale set forth above to claims 11 and 14.

Claim 19 is rejected under the same rationale set forth above to claims 5 and 14.

Claim 20 is rejected under the same rationale set forth above to claims 4 and 14.

Claim 21 is rejected under the same rationale set forth above to claims 6 and 14.

Claim 22 is rejected under the same rationale set forth above to claims 7 and 14.

Claim 23 is rejected under the same rationale set forth above to claims 8 and 14.

Claim 24 is rejected under the same rationale set forth above to claims 9 and 14.

Claim 25 is rejected under the same rationale set forth above to claims 12 and 14.

Claims 26-37 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,515,895 to Naji in view of Saito et al. and further in view of the remark.

Regarding to claim 26, Naji discloses a device comprising a first electrode including a first magnetic layer 11 having a magnetic moment with a direction that is substantially fixed in response to an applied magnetic field; a second electrode including a second magnetic layer 12 having a magnetic moment with a direction that is variable in response to the applied magnetic field; and a dielectric layer 14 separating the first and second magnetic layers. Naji does not disclose the dielectric layer having a thickness of less than five nanometers and containing a magnetic element substantially uniformly dispersed in an atomic concentration of less than about five percent; wherein an electrical current between the electrodes depends upon an orientation of the second magnetic moment relative to that of the first magnetic moment. Saito teaches the dielectric layer having a thickness of less than five nanometers as set forth in col. 11, lines 1-4.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric layer having a thickness of less than five

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nanometers, as taught by Saito et al. in order to enable a higher capacity, to assure a high reliability, and to have a high yield (col. 2, lines 54-56).

Claim 27 is rejected under the same rationale set forth above to claim 2.

Claim 28 is rejected under the same rationale set forth above to claim 3.

Claim 29 is rejected under the same rationale set forth above to claim 17.

Claim 30 is rejected under the same rationale set forth above to claim 18.

Claim 31 is rejected under the same rationale set forth above to claim 5.

Claim 32 is rejected under the same rationale set forth above to claim 4.

Claim 33 is rejected under the same rationale set forth above to claim 6.

Claim 34 is rejected under the same rationale set forth above to claim 7.

Claim 35 is rejected under the same rationale set forth above to claim 8.

Claim 36 is rejected under the same rationale set forth above to claim 9.

Claim 37 is rejected under the same rationale set forth above to claim 25.

Conclusion

Any inquiry concerning this communication on earlier communications from the examiner should be directed to Mai-Huong Tran, (703) 305-1958. The examiner can normally be reached on Monday-Thursday from 8:00 AM to 6:30 PM. The examiner's supervisor, David Nelms can be reached on (703) 308-4910.

The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7724. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Mai-Huong Tran



HOAI HO
PRIMARY EXAMINER